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(54) Title: TISSUE GRASPING DEVICES

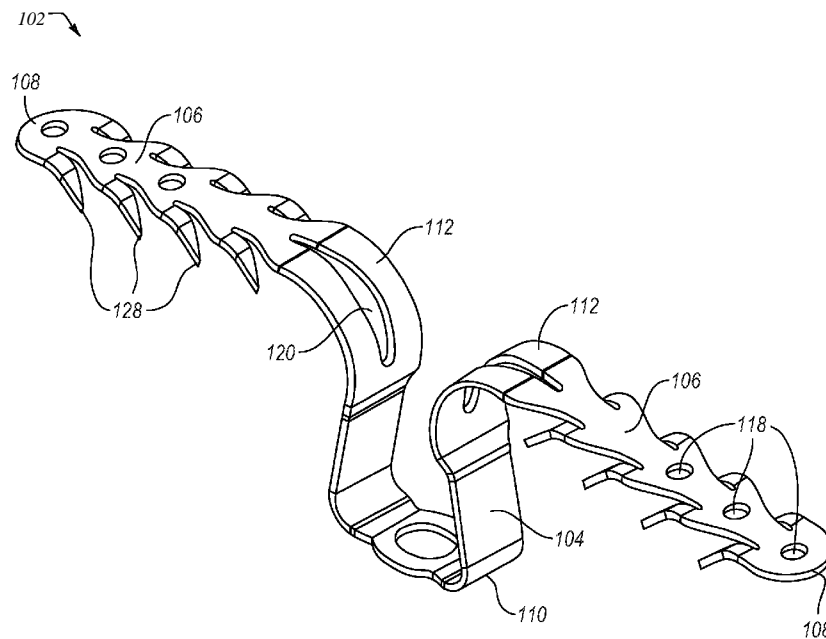


FIG. 9A

(57) Abstract: A tissue gripping device is formed from a shape-memory material, and has a base section, a first arm, and a second arm disposed opposite the first arm, each arm having a first end coupled to the base section and a free end extending from the base section. The arms of the tissue gripping device are configured to resiliently flex toward a relaxed configuration in a distal direction as the tissue gripping device is moved from a pre-deployed configuration toward a deployed configuration. The tissue gripping device is usable in a method for gripping tissue. The method includes positioning the tissue gripping device near target tissue and moving the tissue gripping device from a pre-deployed configuration toward a deployed configuration in order to grip the target tissue.



GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/00
 ADD.
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	wo 2016/161135 AI (ABBOTT CARDIOVASCULAR SYSTEMS INC [US]) 6 October 2016 (2016-10-06) paragraph [0035] - paragraph [0081] ; figures 5-II C -----	1-4, 6-12 , 16, 17, 27-30, 33,35
X	DE 198 10 696 CI (KARLSRUHE FORSCHZENT [DE]) 6 May 1999 (1999-05-06) column 3, line 10 - line 59; figures -----	1-5 , 7, 8
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 18 January 2018	Date of mailing of the international search report 01/02/2018
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Croatto, Loredana
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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	Wo 2007/038608 A2 (COHEREX MEDICAL INC [US] ; WHISENANT BRIAN K [US] ; DAVIS CLARK C [US] ;) 5 April 2007 (2007-04-05) page 11, line 12 - page 18, line 31; figures -----	35

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/042971

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: 18-26
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy
2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos. :
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos. :

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2016/042971

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International application No

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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-8

A tissue gripping device comprising: a base section; and a first arm having a first end coupled to the base section, and a free end extending from the base section; wherein the base section and the arm are formed of a shape-memory material configured to exhibit superelasticity in a physiological environment.

2. claims: 9-17

A tissue fixation system configured for intravascular delivery and for use in joining mitral valve tissue during treatment of the mitral valve, comprising: a body; a first and second distal element, each including: a first end pivotally coupled to the body and extending to a free second end; and a tissue engagement surface between the first and second end, the tissue engagement surface being configured to approximate and engage a portion of leaflets of the mitral valve; and a tissue gripping device formed of a shape-memory material, including: a base section; and a first arm and a second arm, each arm having a first end coupled to the base section and a free end extending from the base section, the first and second arms being disposed opposite one another and each arm being configured to cooperate with one of the first or second distal elements to form a space for receiving and holding a portion of mitral valve tissue therebetween.

3. claims: 27-34

A method of manufacturing a tissue gripping device, the method comprising: cutting one or more structural features into a strip or sheet stock material of a shape-memory alloy, the one or more structural features including a plurality of slotted recesses disposed at one or more side edges of the stock material; and heat shape setting one or more bend features into the stock material.

4. claim: 35

A tissue fixation kit, the kit comprising: a tissue gripping system, the tissue gripping system including: an actuator rod; an actuator line; a first and second distal element, each including a first end pivotally coupled to the actuator rod and extending to a free second end and a tissue engagement surface between the first and second end, the first and second distal elements being positionable by the actuator rod; a tissue gripping device formed of a shape-memory

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

material, the tissue gripping device including a base section, a first arm, and a second arm, each arm having a first end coupled to the base section and a free end extending from the base section, the tissue gripping device being positionable by the actuator line; a handle; and a delivery catheter having a proximal end and a distal end, the tissue gripping system being couplable to the distal end of the delivery catheter and the handle being couplable to the proximal end of the delivery catheter.
